Certificate #4312.01

TEST REPORT

Product Name:	8-Port L2-Lite Managed Gigabit Switch
Trade Mark:	GRANDSTREAM
Model No.:	GWN7711
Report Number:	2310247545EMC-1
Test Standards:	FCC 47 CFR Part 15 Subpart B ICES-003 Issue 7
FCC ID:	YZZGWN7711
Test Result:	PASS
Date of Issue:	December 27, 2023

Prepared for:

Grandstream Networks, Inc.
126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by:	David Chen	Reviewed by:	Robben Chen
	David Chen Senior Project Engineer		Robben Chen Assistant Manager
Approved by:		Date:	December 27, 2023
	Billy Li Technical Director		

Version

Version No.	Date	Description
V1.0	December 27, 2023	Original

CONTENTS

1. GENERAL INFORMATION 4
   1.1 CLIENT INFORMATION 4
   1.2 EUT INFORMATION 4
      1.2.1 GENERAL DESCRIPTION OF EUT 4
      1.2.2 DESCRIPTION OF ACCESSORIES 4
   1.3 DESCRIPTION OF SUPPORT UNITS 5
   1.4 TEST LOCATION 5
   1.5 TEST FACILITY 5
   1.6 DEVIATION FROM STANDARDS 6
   1.7 ABNORMALITIES FROM STANDARD CONDITIONS 6
   1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER 6
   1.9 MEASUREMENT UNCERTAINTY 6
2. TEST SUMMARY 7
3. EQUIPMENT LIST 8
4. TEST CONFIGURATION 9
   4.1 ENVIRONMENTAL CONDITIONS FOR TESTING 9
      4.1.1 NORMAL OR EXTREME TEST CONDITIONS 9
      4.1.2 RECORD OF NORMAL ENVIRONMENT AND TEST SAMPLE 9
   4.2 TEST MODES 9
   4.3 TEST SETUP 10
      4.3.1 FOR RADIATED EMISSIONS TEST SETUP 10
      4.3.2 FOR CONDUCTED EMISSIONS TEST SETUP 11
   4.4 SYSTEM TEST CONFIGURATION 11
5. REFERENCE DOCUMENTS FOR TESTING 12
6. EMC REQUIREMENTS SPECIFICATION 12
   6.1 RADIATED EMISSION 12
   6.2 CONDUCTED EMISSION 30

APPENDIX 1 PHOTOS OF TEST SETUP 39
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS 39

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Grandstream Networks, Inc.
Address of Applicant:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Address of Manufacturer:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	8-Port L2-Lite Managed Gigabit Switch
Model No.:	GWN7711
Trade Mark:	GRANDSTREAM
DUT Stage:	Identical Prototype
Rated Voltage:	5.0 V ⎓ 0.6 A supplied by adapter
Classification of digital devices:	Class B
Highest Internal Frequency:	500 MHz
Sample Received Date:	November 10, 2023
Sample Tested Date:	December 5, 2023 to December 16, 2023
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.	

1.2.2 Description of Accessories

Adapter (1)	
Model No.:	GQ06-050060-ZU
Input:	100-240 V~50/60 Hz 0.3 A Max
Output:	5.0 V ⎓ 0.6 A
DC Cable:	1.8 Meter, Unshielded without ferrite

Adapter (2)	
Model No.:	DCT06W050060US-D0
Input:	100-240 V~50/60 Hz 200 mA
Output:	5.0 V ⎓ 0.6 A
DC Cable:	1.8 Meter, Unshielded without ferrite

Adapter (3)	
Model No.:	F06US0500060A
Input:	100-240 V~50/60 Hz 0.2 A Max
Output:	5.0 V ⎓ 0.6 A
DC Cable:	1.8 Meter, Unshielded without ferrite

1.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	E450	SL10G10780	UnionTrust
Network Analyst	Xtramus	nustreams-600	0JNS600C0013	UnionTrust
Mouse	DELL	MS111	CN-011D3V-73826-62N-0LK	UnionTrust

Support Cable

Cable No.	Description	Connector	Length(Meter)	Supplied by
1	Ethernet Cable*8	RJ45	1.0 Unshielded without ferrite	UnionTrust
2	Ethernet Cable*1	RJ45	2.0 Unshielded without ferrite	UnionTrust

1.4 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.5 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.9 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9kHz-150kHz	±3.2 dB
2	Conducted emission 150kHz-30MHz	±2.7 dB
3	Radiated emission 9kHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart B Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Conducted Emission	FCC 47 CFR Part 15.107 ICES-003 Issue 7 Section 3.2.1	ANSI C63.4-2014	PASS
Radiated Emission	FCC 47 CFR Part 15.109 ICES-003 Issue 7 Section 3.2.2	ANSI C63.4-2014	PASS

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	3m SAC	ETS-LINDGREN	3m	Euroshiedpn-CT001270-1317	22-Jan-2021	21-Jan-2024
☒	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
☒	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	16- Apr-2023	15- Apr-2025
☒	Pre-amplifier	ETS-Lindgren	00118385	00201874	31-Oct-2023	30-Oct-2024
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	27-Oct-2023	26-Oct-2024
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	27-Oct-2023	26-Oct-2024
☒	LISN	R&S	ESH2-Z5	860014/024	27-Oct-2023	26-Oct-2024
☒	LISN	ETS-Lindgren	3816/2SH	00201088	27-Oct-2023	26-Oct-2024
☒	Test Software	EZ-EMC	EZ-CON	Software Version: EMC-CON 3A1.1		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NV/NT	+15 to +35	5.0 V ⎓ 0.6 A supplied by adapter	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test sample

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Conducted Emission	25.1	51.6	100.3	S202310242286-ZJC04/4	Linson Xie
Radiated Emission	25.5	56.1	100.0		Fire Huo

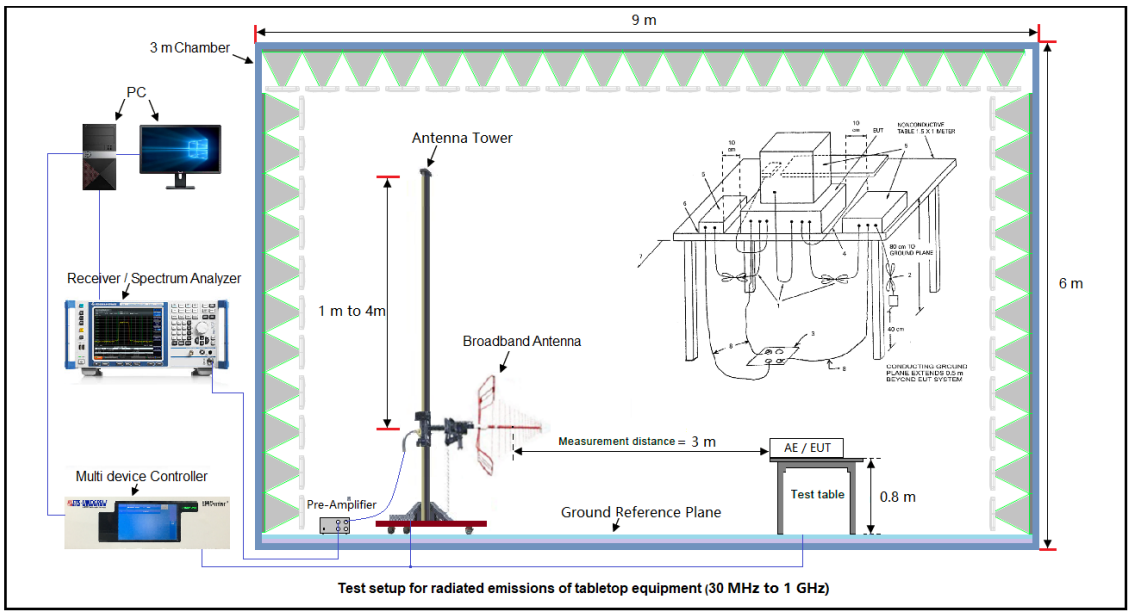
4.2 TEST MODES

Test Item	EMI Test Modes
Radiated Emission	Test Mode 1: AC120V~60Hz (Adaptor1) + LAN Port Loop transmission Test Mode 2: AC240V~50Hz (Adaptor1) + LAN Port Loop transmission Test Mode 3: Worst from mode 1~2(Adaptor2) Test Mode 4: Worst from mode 1~2(Adaptor3)
Conducted Emission	Test Mode 1: AC120V~60Hz (Adaptor1) + LAN Port Loop transmission Test Mode 2: AC240V~50Hz (Adaptor1) + LAN Port Loop transmission Test Mode 3: Worst from mode 1~2(Adaptor2) Test Mode 4: Worst from mode 1~2(Adaptor3)

4.3 TEST SETUP

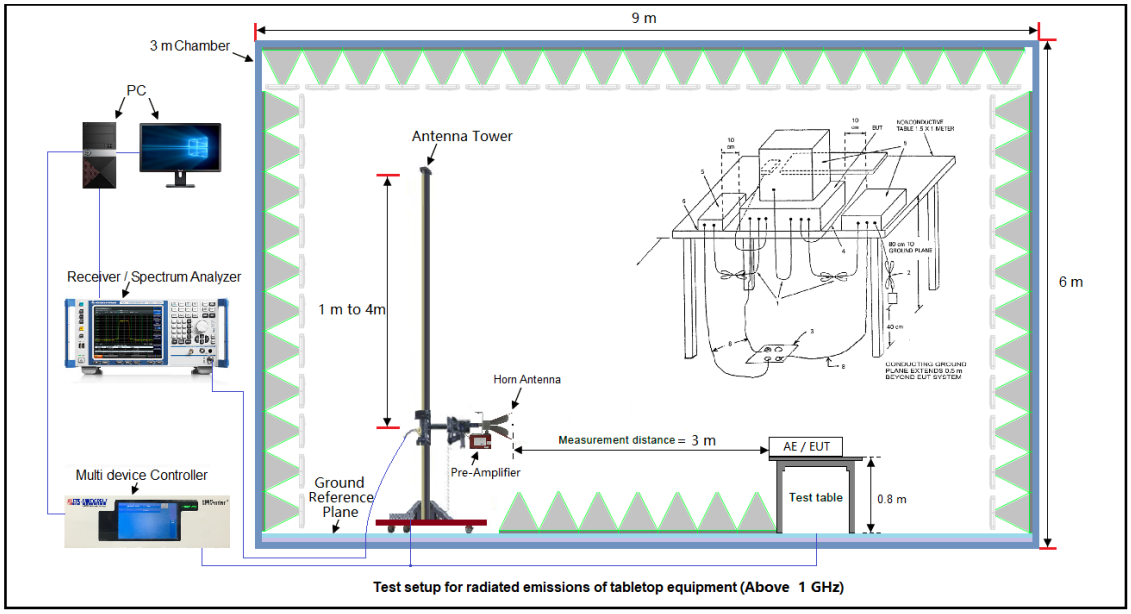
4.3.1 For Radiated Emissions test setup

Figure 1. 30MHz to 1GHz



Test setup for radiated emissions of tabletop equipment (30 MHz to 1 GHz)

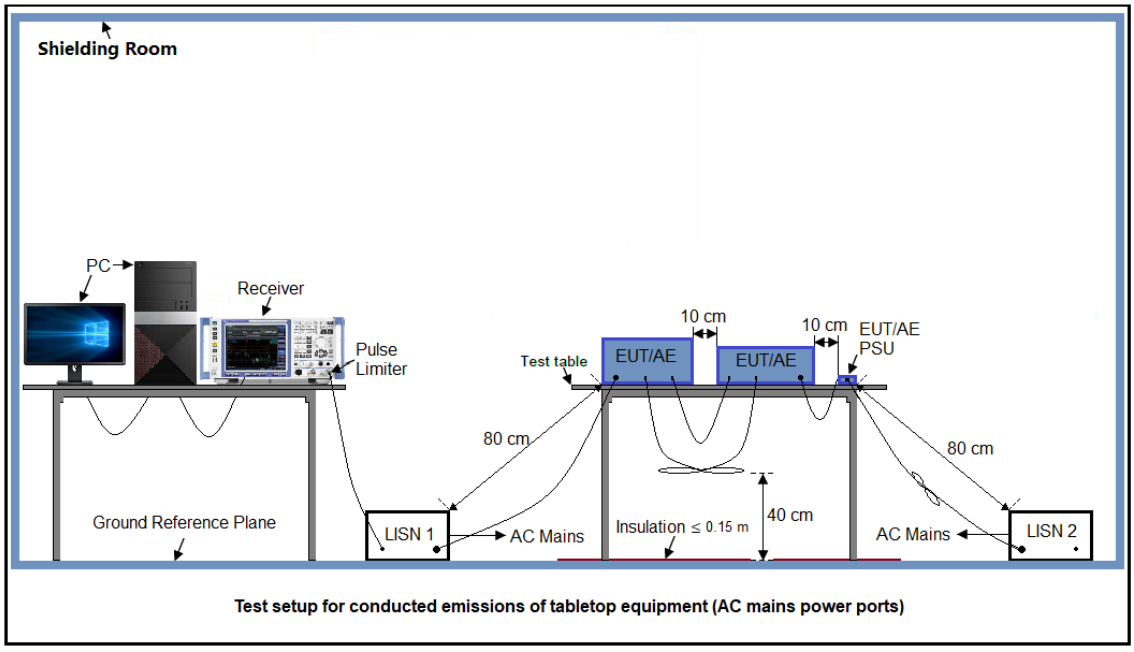
Figure 2. Above 1GHz



Test setup for radiated emissions of tabletop equipment (Above 1 GHz)

4.3.2 For Conducted Emissions test setup

Figure 3. Conducted Emissions setup



Test setup for conducted emissions of tabletop equipment (AC mains power ports)

4.4 SYSTEM TEST CONFIGURATION

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic (according to KDB 896810 D02 SDoC FAQ v01r01) of the highest fundamental frequency or to 40 GHz, whichever is lower.

5. REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part15 Subpart B	Unintentional Radiators
2	ICES-003 Issue 7	Information Technology Equipment (Including Digital Apparatus)
3	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4	KDB 174176 D01 Line Conducted FAQ v01r01	AC power-line conducted emission frequency asked questions
5	KDB 896810 D02 SDoC FAQ v01r02	Supplier's Declaration of Conformity frequency asked questions

6. EMC REQUIREMENTS SPECIFICATION

6.1 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.109
ICES-003 Issue 7 Clause 3.2.2

Test Method: ANSI C63.4-2014

Receiver Setup:

Frequency: (f) (MHz)	Detector type	Measurement receiver bandwidth	
		RBW	VBW
30 ≤ f ≤ 1 000	Quasi Peak	120 kHz	300 kHz
f ≥1000	Peak	1 MHz	3 MHz
	Average	1 MHz	3 MHz

Measured frequency range

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Limits:

Limits for Class B devices

FCC 47 CFR Part 15 Subpart B

Frequency (MHz)	limits at 3m (dBμV/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 960	46.0		
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

ICES-003 Issue 7

Frequency (MHz)	limits at 3m (dBμV/m)		
	QP Detector	PK Detector	AV Detector
30 – 88	40.0	--	--
88 – 216	43.5	--	--
216 – 230	46.0		

230 – 960	47.0	--	--
960 – 1000	54.0	--	--
Above 1000	--	74.0	54.0

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.3.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
3) For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

2. Above 1GHz test procedure as below:

1) The Product was placed on the non-conductive turntable 0.8 m above the ground at a chamber.
2) Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
3) For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

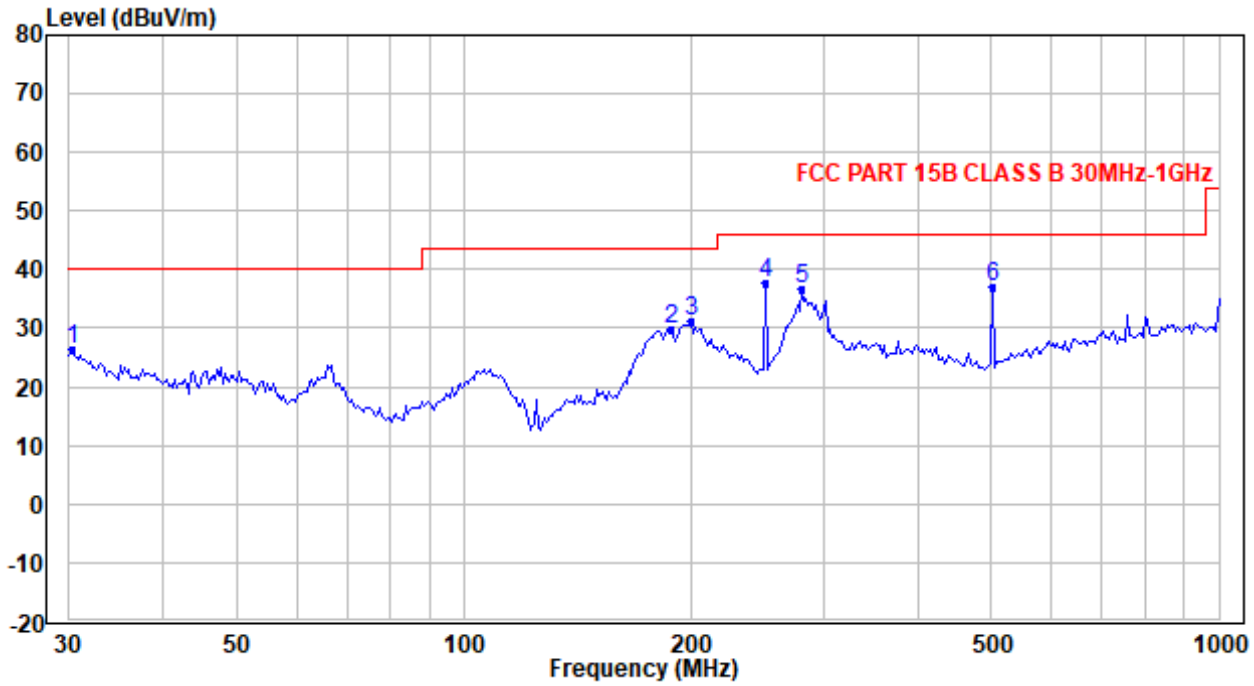
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

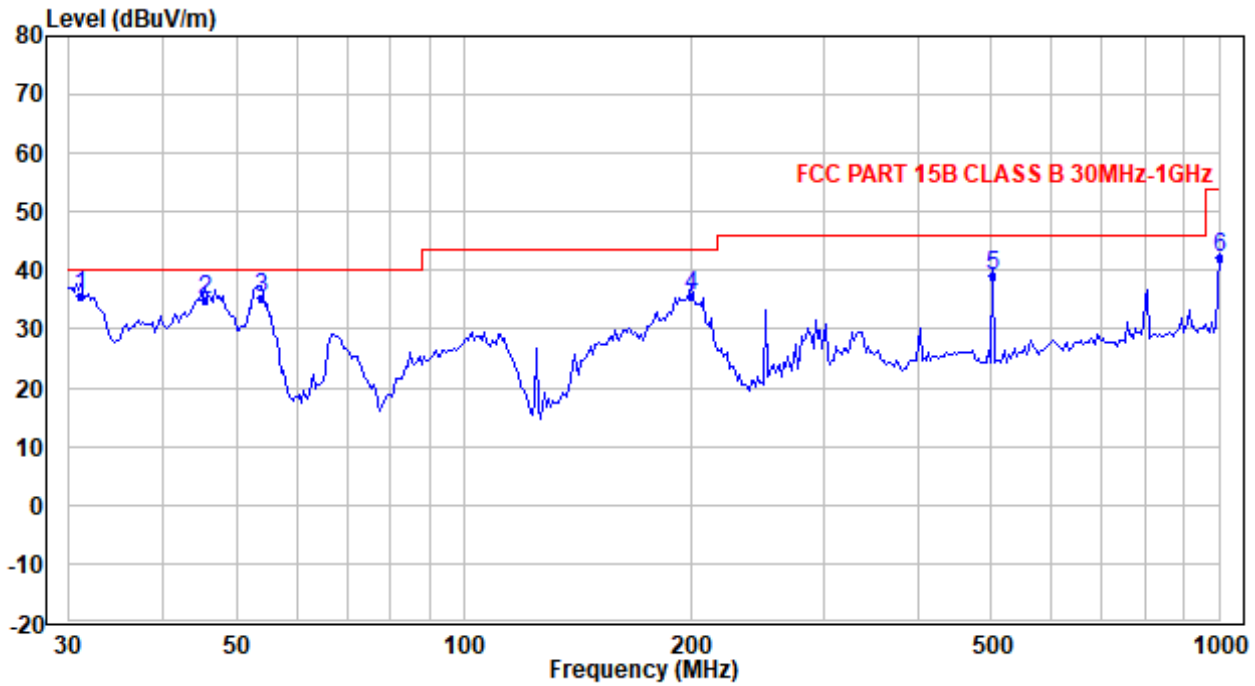
The measurement data for FCC 47 CFR Part 15 Subpart B as follows:

Below 1GHz(Quasi Peak):
Test Mode1
Horizontal



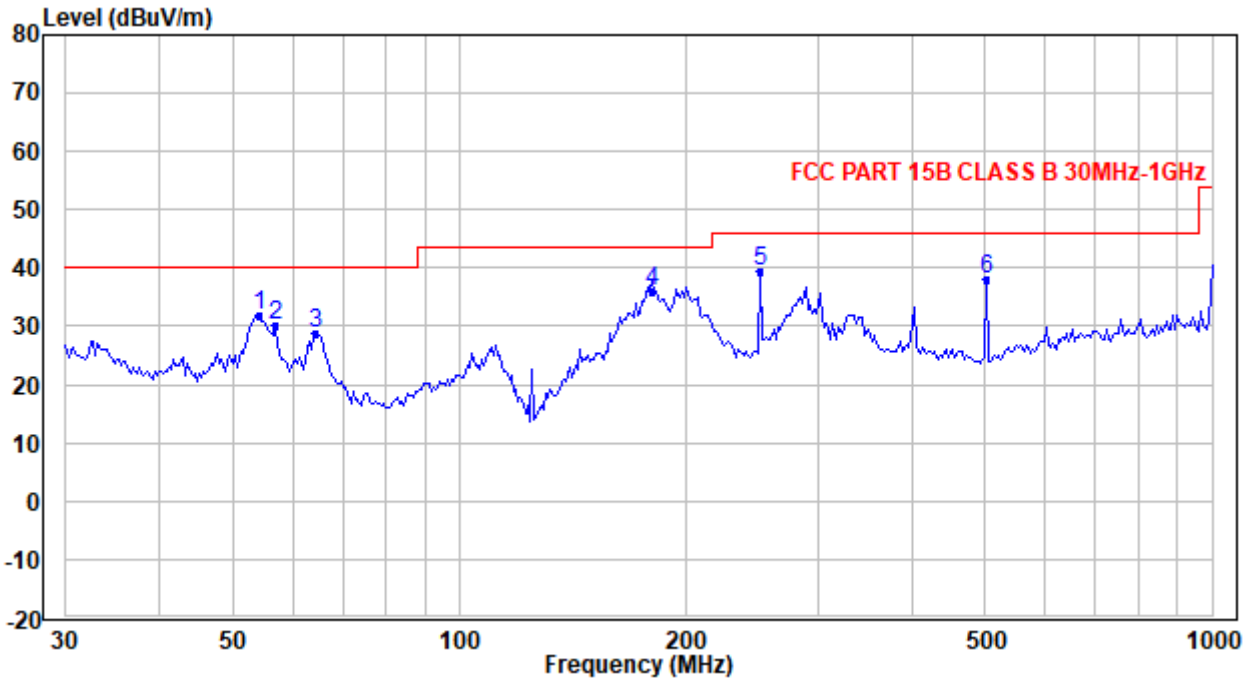
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	30.212	31.04	-4.78	26.26	40.00	-13.74	QP
2	187.783	40.05	-10.19	29.86	43.50	-13.64	QP
3	200.043	41.74	-10.50	31.24	43.50	-12.26	QP
4	250.486	46.54	-8.69	37.85	46.00	-8.15	QP
5	280.294	43.89	-7.33	36.56	46.00	-9.44	QP
6	502.247	38.88	-1.92	36.96	46.00	-9.04	QP

Vertical



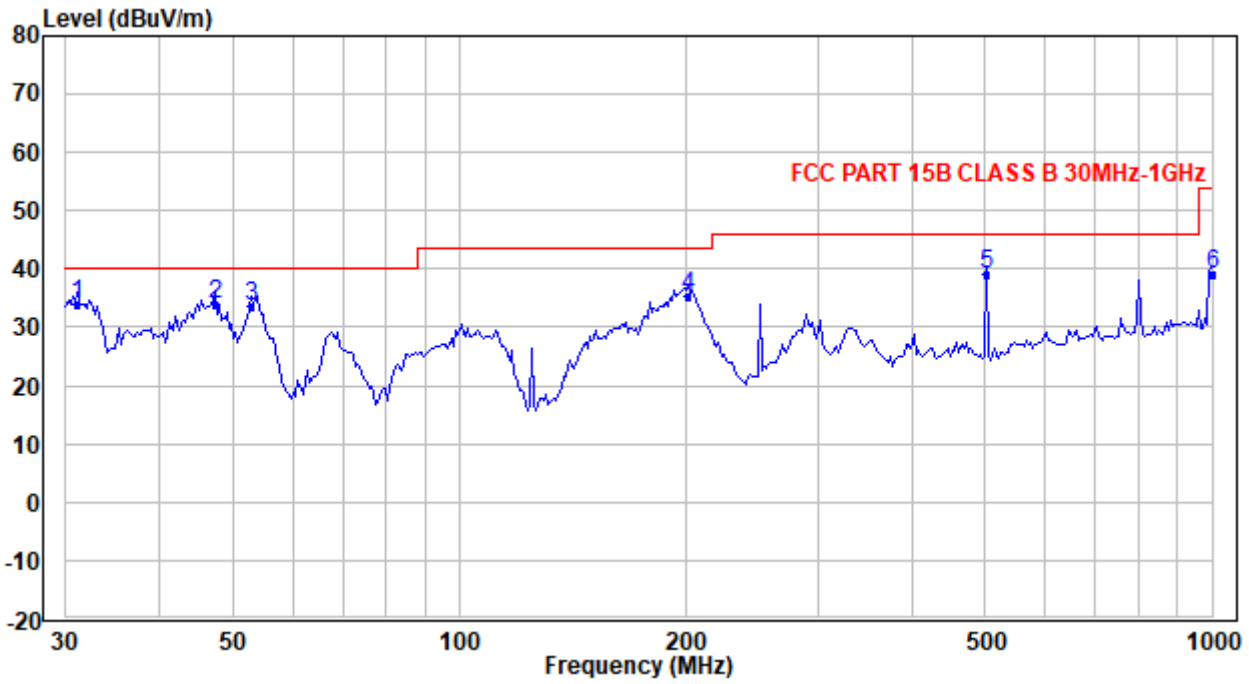
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	31.073	40.72	-5.01	35.71	40.00	-4.29	QP
2	45.413	46.77	-11.69	35.08	40.00	-4.92	QP
3	53.756	51.65	-16.18	35.47	40.00	-4.53	QP
4	200.043	46.21	-10.50	35.71	43.50	-7.79	QP
5	502.247	41.19	-1.92	39.27	46.00	-6.73	QP
6	1000.000	36.77	5.40	42.17	54.00	-11.83	QP

Below 1GHz(Quasi Peak):
Test Mode2
Horizontal



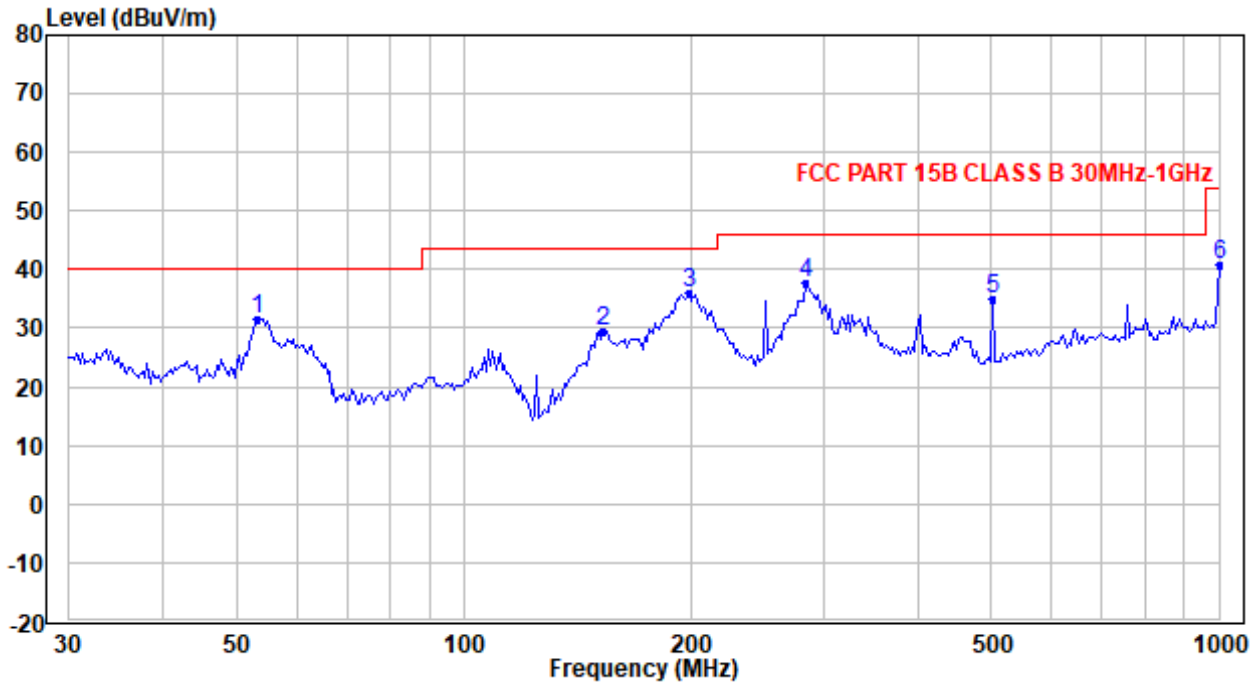
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	54.135	48.01	-16.27	31.74	40.00	-8.26	QP
2	56.864	47.22	-17.13	30.09	40.00	-9.91	QP
3	64.532	45.96	-17.19	28.77	40.00	-11.23	QP
4	180.030	46.16	-10.31	35.85	43.50	-7.65	QP
5	250.486	48.28	-8.69	39.59	46.00	-6.41	QP
6	502.247	40.13	-1.92	38.21	46.00	-7.79	QP

Vertical



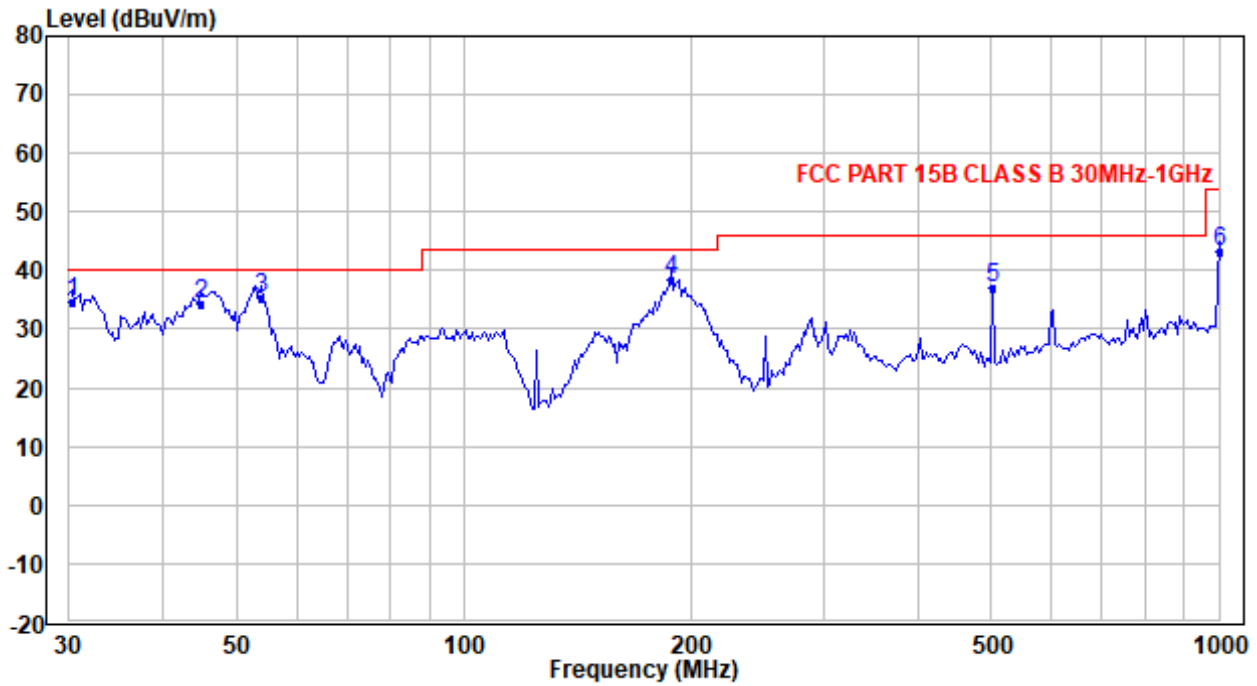
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	31.073	38.88	-5.01	33.87	40.00	-6.13	QP
2	47.369	46.77	-12.86	33.91	40.00	-6.09	QP
3	53.006	49.56	-16.10	33.46	40.00	-6.54	QP
4	201.454	45.76	-10.55	35.21	43.50	-8.29	QP
5	502.247	41.08	-1.92	39.16	46.00	-6.84	QP
6	1000.000	33.82	5.40	39.22	54.00	-14.78	QP

Below 1GHz(Quasi Peak):
Test Mode3:
Horizontal



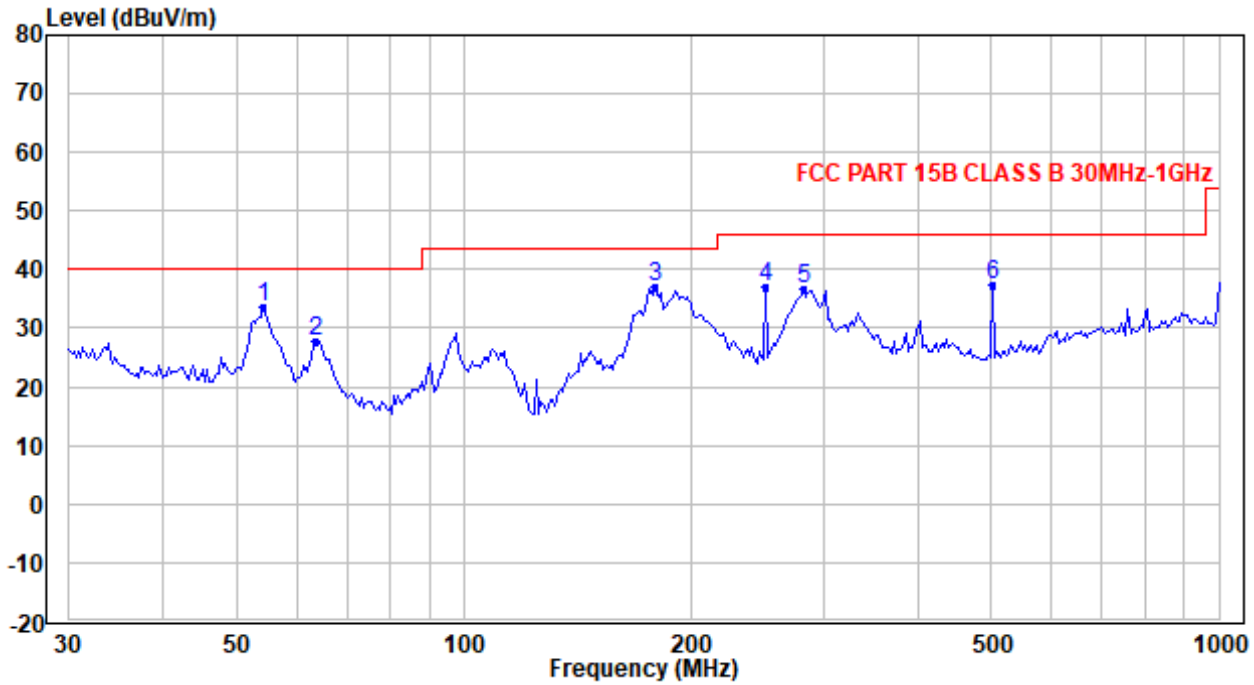
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	53.379	47.74	-16.14	31.60	40.00	-8.40	QP
2	153.163	44.48	-14.89	29.59	43.50	-13.91	QP
3	198.642	46.35	-10.42	35.93	43.50	-7.57	QP
4	284.261	44.76	-7.05	37.71	46.00	-8.29	QP
5	502.247	36.86	-1.92	34.94	46.00	-11.06	QP
6	1000.000	35.27	5.40	40.67	54.00	-13.33	QP

Vertical



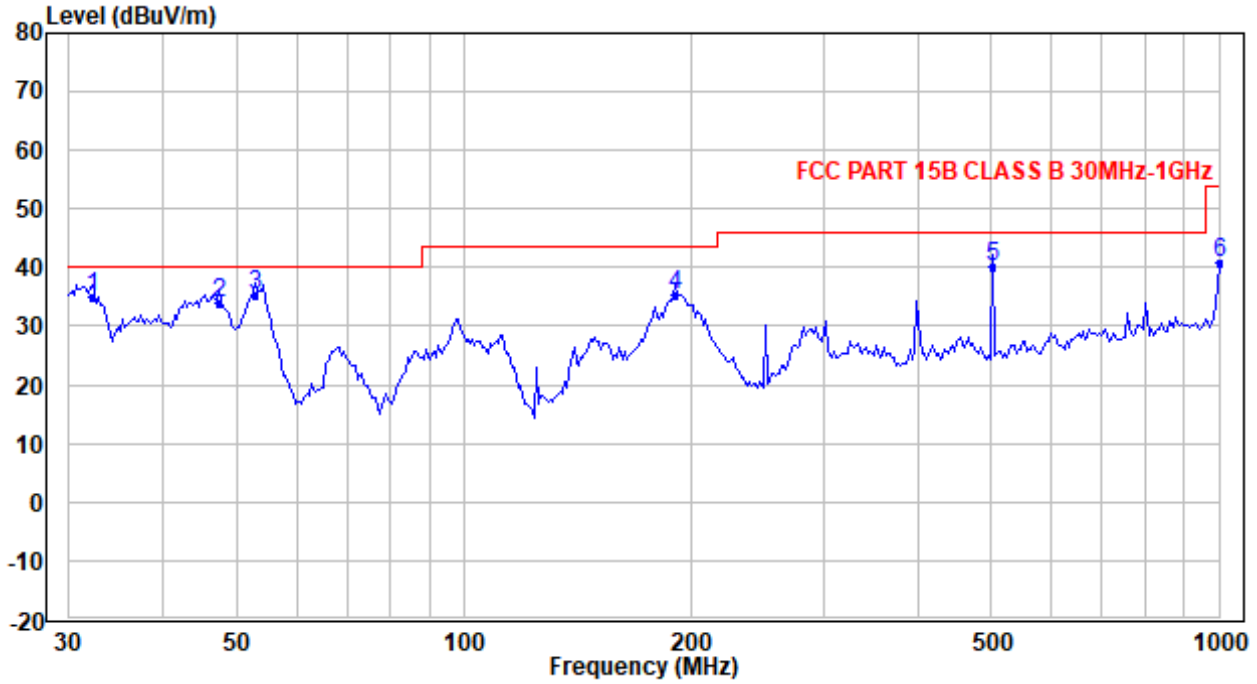
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	30.212	39.38	-4.78	34.60	40.00	-5.40	QP
2	44.779	45.57	-11.25	34.32	40.00	-5.68	QP
3	53.756	51.59	-16.18	35.41	40.00	-4.59	QP
4	187.783	48.77	-10.19	38.58	43.50	-4.92	QP
5	502.247	38.91	-1.92	36.99	46.00	-9.01	QP
6	1000.000	37.92	5.40	43.32	54.00	-10.68	QP

Below 1GHz(Quasi Peak):
Test Mode4:
Horizontal



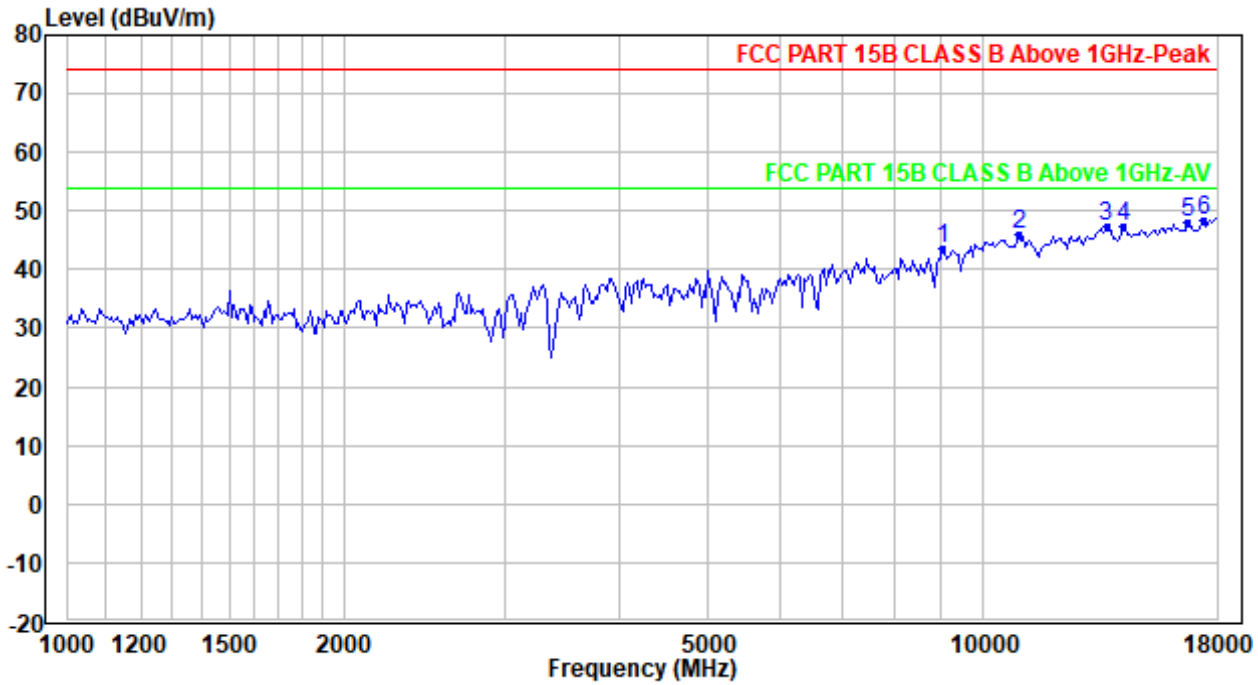
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	54.135	49.83	-16.27	33.56	40.00	-6.44	QP
2	63.631	45.14	-17.21	27.93	40.00	-12.07	QP
3	178.770	46.89	-9.88	37.01	43.50	-6.49	QP
4	250.486	45.80	-8.69	37.11	46.00	-8.89	QP
5	282.270	43.74	-7.20	36.54	46.00	-9.46	QP
6	502.247	39.22	-1.92	37.30	46.00	-8.70	QP

Vertical



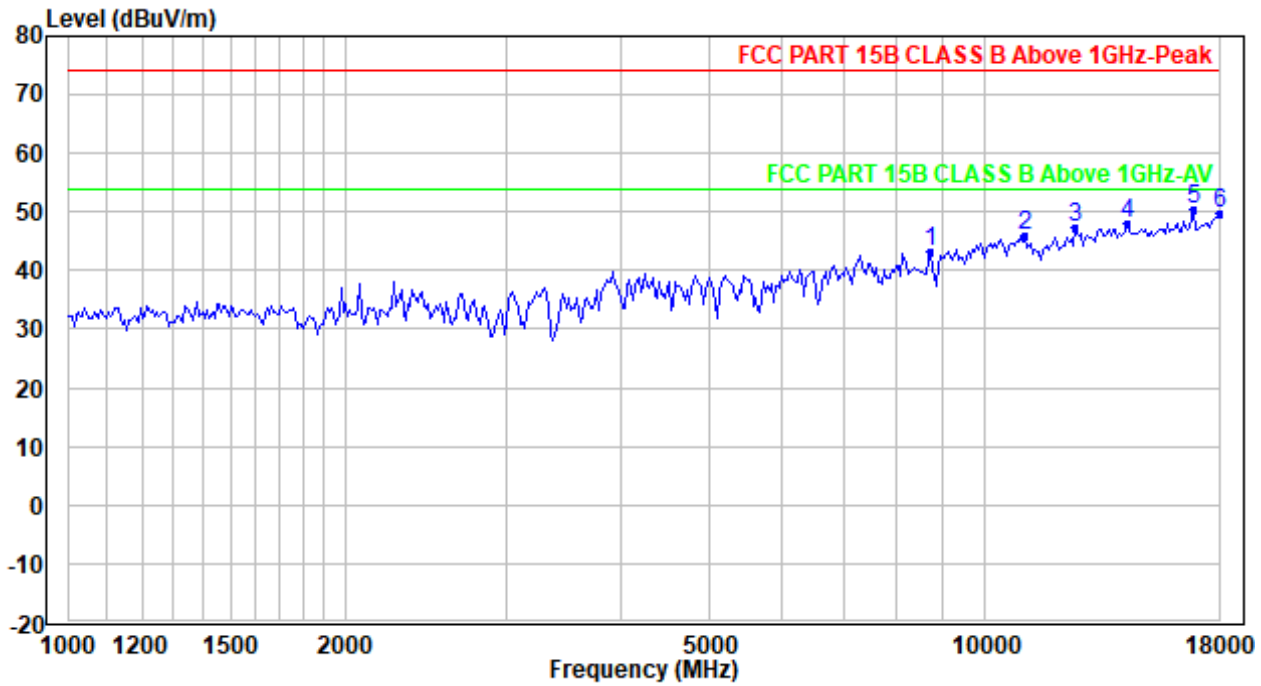
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	32.184	40.26	-5.11	35.15	40.00	-4.85	QP
2	47.369	46.75	-12.86	33.89	40.00	-6.11	QP
3	53.006	51.39	-16.10	35.29	40.00	-4.71	QP
4	190.441	45.93	-10.66	35.27	43.50	-8.23	QP
5	502.247	42.22	-1.92	40.30	46.00	-5.70	QP
6	1000.000	35.40	5.40	40.80	54.00	-13.20	QP

Above 1GHz(Peak & Average)
Test Mode1:
Horizontal



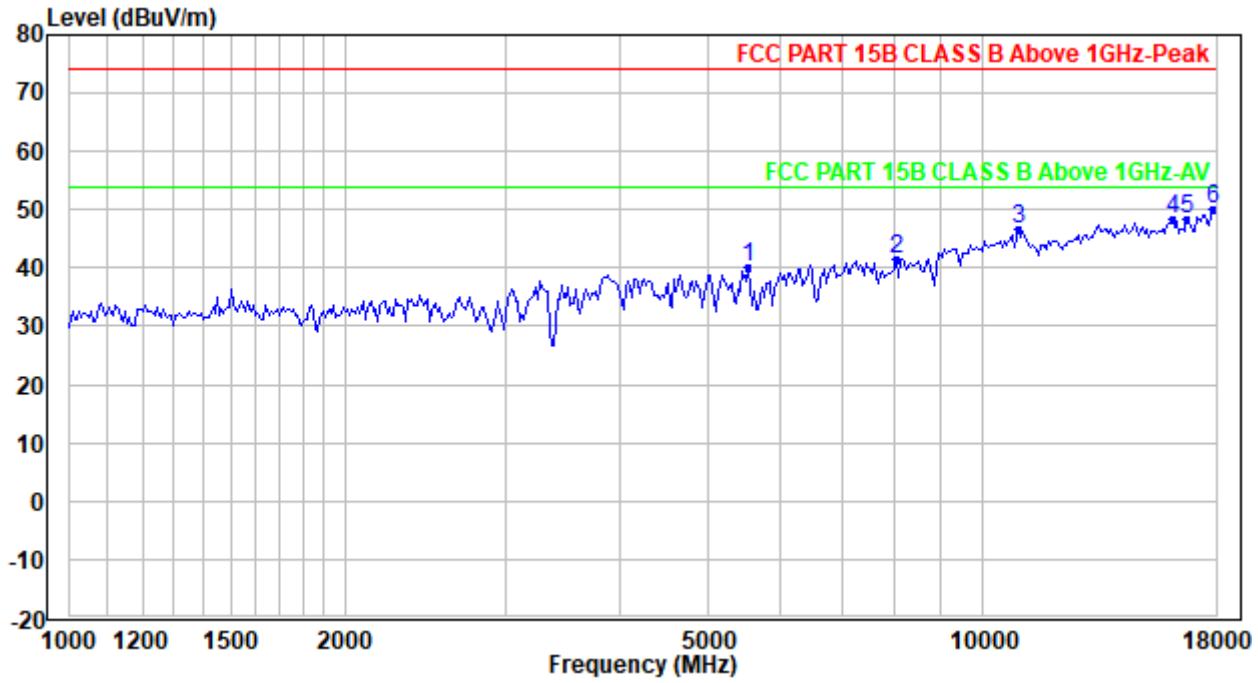
No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
1	9034.809	38.12	5.56	43.68	74.00	-30.32	Peak
2	10937.880	37.75	8.11	45.86	74.00	-28.14	Peak
3	13630.910	34.48	12.71	47.19	74.00	-26.81	Peak
4	14194.950	34.46	12.76	47.22	74.00	-26.78	Peak
5	16694.370	35.12	12.84	47.96	74.00	-26.04	Peak
6	17385.170	34.32	14.07	48.39	74.00	-25.61	Peak

Vertical



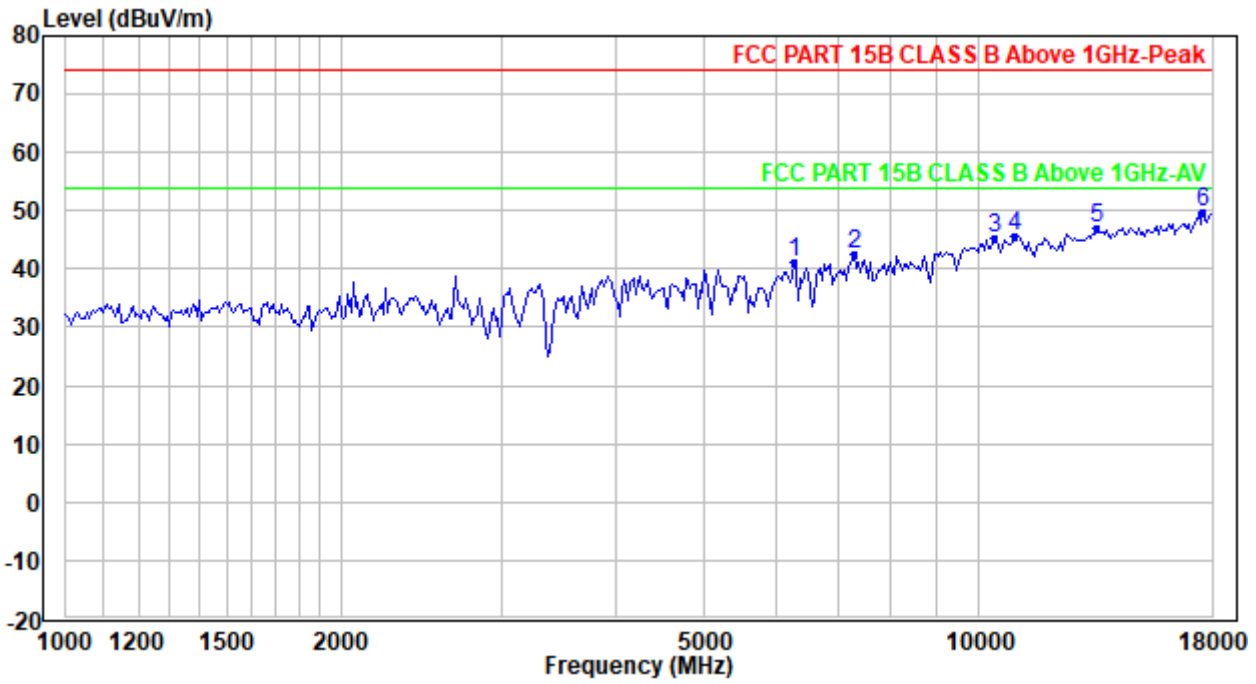
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	8726.206	38.54	4.81	43.35	74.00	-30.65	Peak
2	11065.320	37.72	8.16	45.88	74.00	-28.12	Peak
3	12569.170	37.87	9.50	47.37	74.00	-26.63	Peak
4	14277.410	35.12	12.79	47.91	74.00	-26.09	Peak
5	16888.890	37.59	12.93	50.52	74.00	-23.48	Peak
6	18000.000	33.47	16.41	49.88	74.00	-24.12	Peak

Above 1GHz(Peak & Average)
Test Mode2:
Horizontal



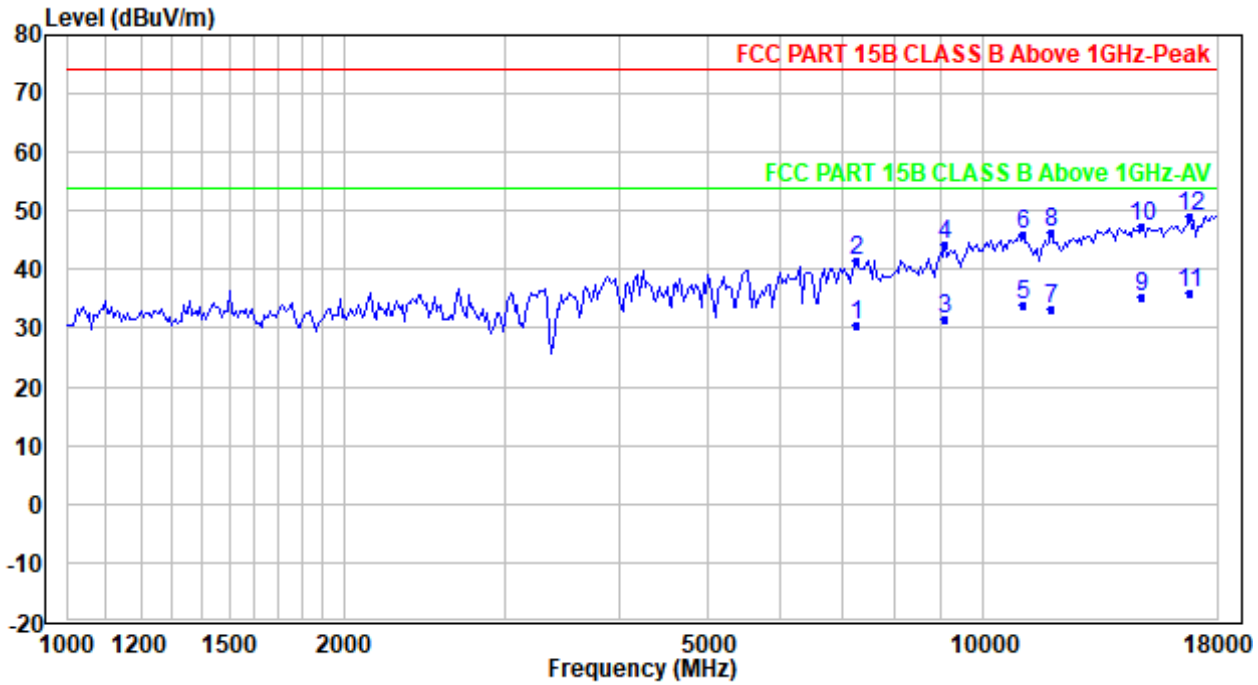
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	5521.982	39.69	0.41	40.10	74.00	-33.90	Peak
2	8046.507	38.04	3.49	41.53	74.00	-32.47	Peak
3	10937.880	38.45	8.11	46.56	74.00	-27.44	Peak
4	16124.140	36.11	12.22	48.33	74.00	-25.67	Peak
5	16694.370	35.66	12.84	48.50	74.00	-25.50	Peak
6	17896.040	34.01	15.99	50.00	74.00	-24.00	Peak

Vertical



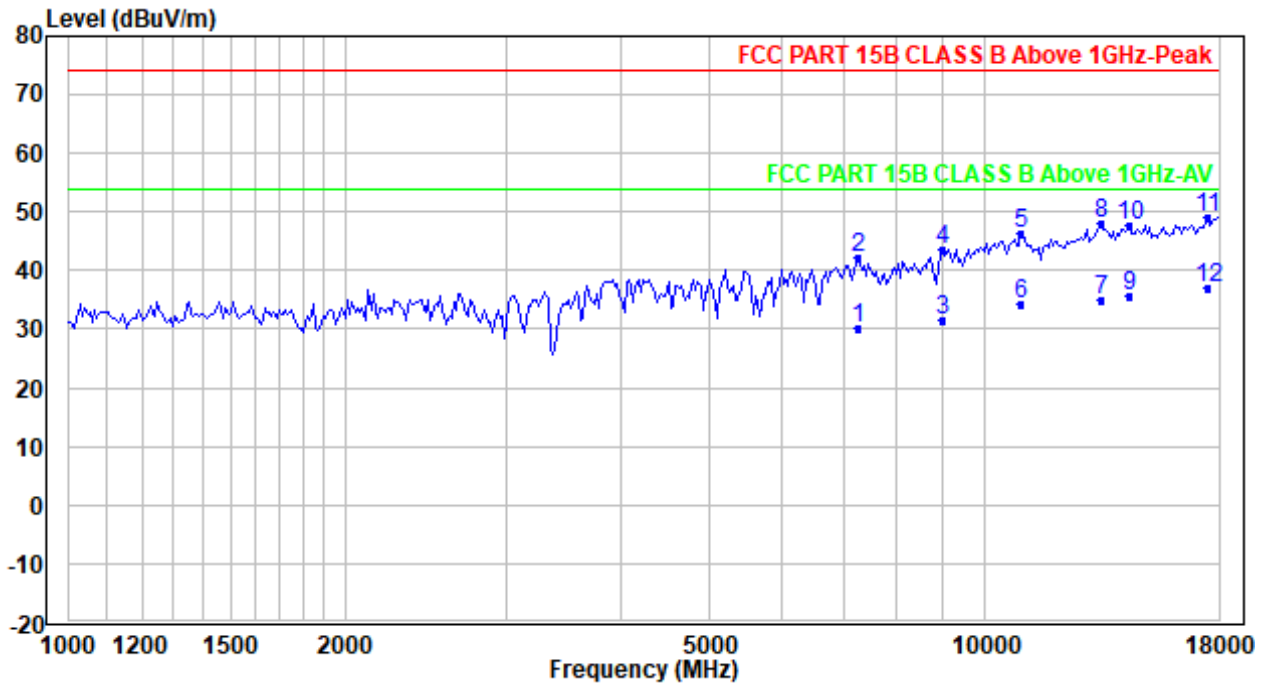
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	6272.456	40.15	0.94	41.09	74.00	-32.91	Peak
2	7291.932	40.40	2.31	42.71	74.00	-31.29	Peak
3	10382.280	38.10	7.20	45.30	74.00	-28.70	Peak
4	10937.880	37.47	8.11	45.58	74.00	-28.42	Peak
5	13473.910	34.54	12.63	47.17	74.00	-26.83	Peak
6	17587.750	34.93	14.75	49.68	74.00	-24.32	Peak

Above 1GHz(Peak & Average)
Test Mode3:
Horizontal



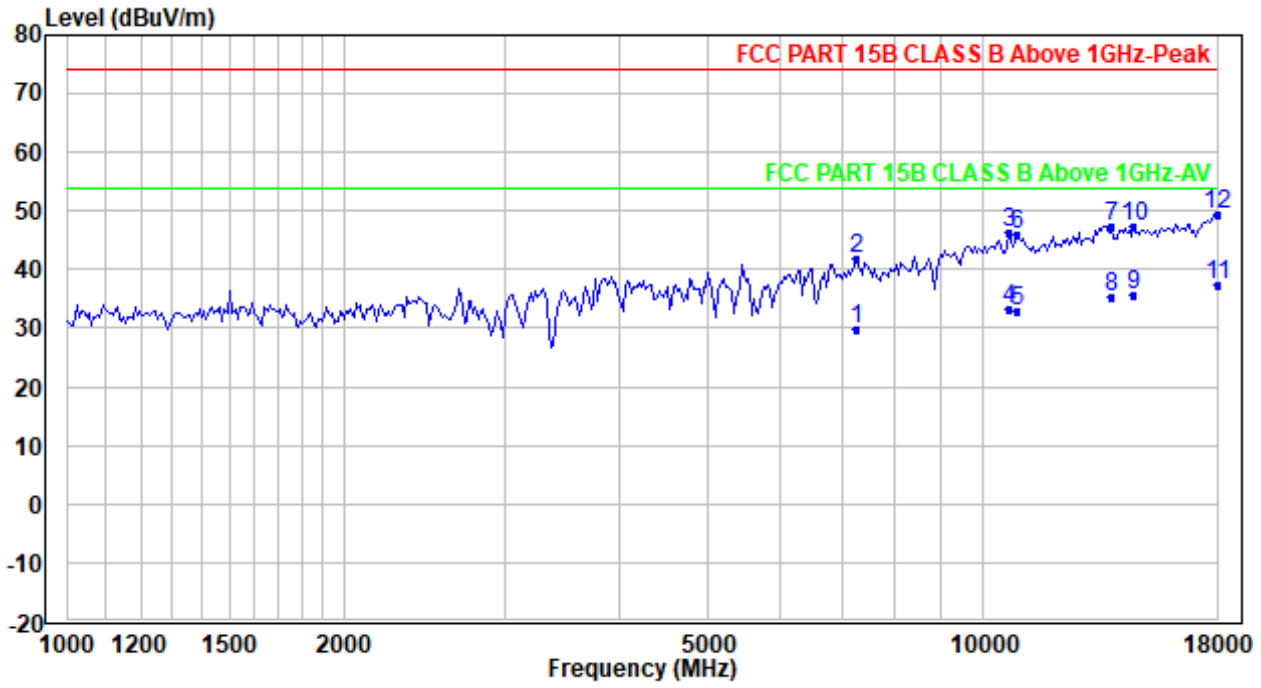
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	7249.817	28.29	2.29	30.58	54.00	-23.42	Average
2	7249.817	39.29	2.29	41.58	74.00	-32.42	Peak
3	9087.293	25.83	5.59	31.42	54.00	-22.58	Average
4	9087.293	38.83	5.59	44.42	74.00	-29.58	Peak
5	11065.320	25.96	8.16	34.12	54.00	-19.88	Average
6	11065.320	37.96	8.16	46.12	74.00	-27.88	Peak
7	11861.810	24.95	8.24	33.19	54.00	-20.81	Average
8	11861.810	37.95	8.24	46.19	74.00	-27.81	Peak
9	14868.200	22.77	12.60	35.37	54.00	-18.63	Average
10	14868.200	34.77	12.60	47.37	74.00	-26.63	Peak
11	16791.350	23.16	12.89	36.05	54.00	-17.95	Average
12	16791.350	36.16	12.89	49.05	74.00	-24.95	Peak

Vertical



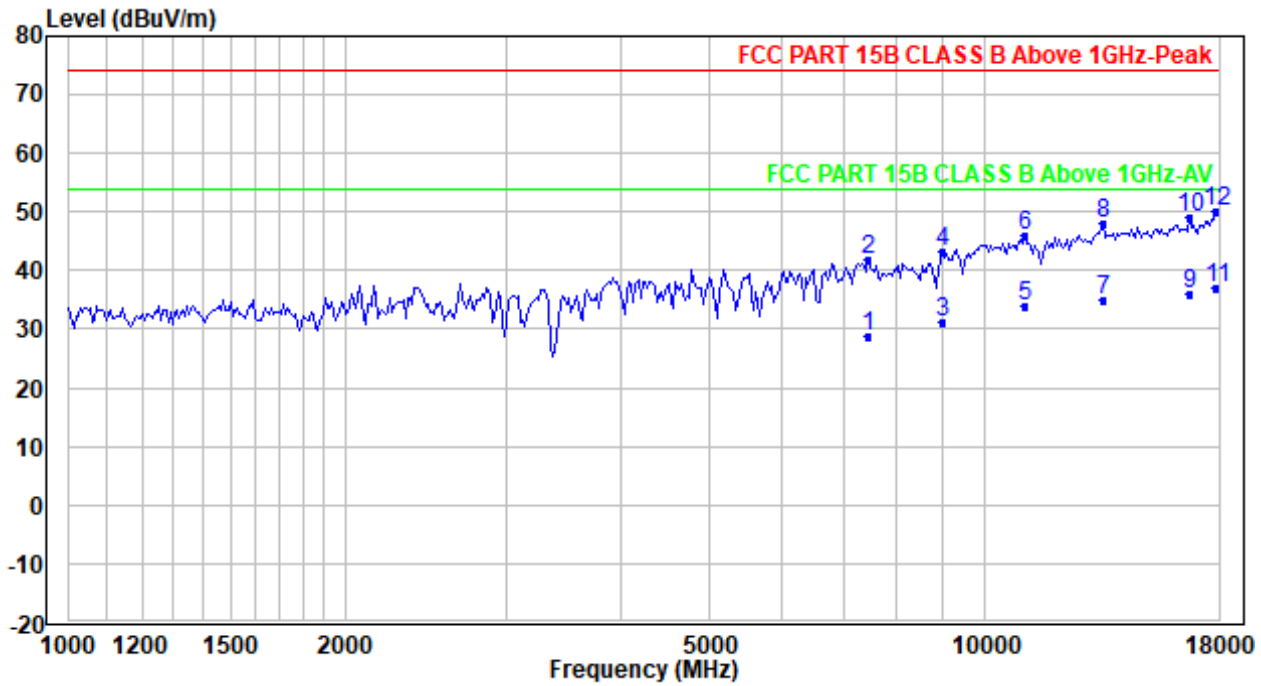
No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	7249.817	27.93	2.29	30.22	54.00	-23.78	Average
2	7249.817	39.93	2.29	42.22	74.00	-31.78	Peak
3	8982.627	26.04	5.49	31.53	54.00	-22.47	Average
4	8982.627	38.04	5.49	43.53	74.00	-30.47	Peak
5	10937.880	38.08	8.11	46.19	74.00	-27.81	Average
6	10937.880	26.08	8.11	34.19	54.00	-19.81	Peak
7	13396.090	22.54	12.38	34.92	54.00	-19.08	Average
8	13396.090	35.54	12.38	47.92	74.00	-26.08	Peak
9	14360.350	22.96	12.83	35.79	54.00	-18.21	Average
10	14360.350	34.96	12.83	47.79	74.00	-26.21	Peak
11	17486.170	34.67	14.36	49.03	74.00	-24.97	Average
12	17486.170	22.67	14.36	37.03	54.00	-16.97	Peak

Above 1GHz(Peak & Average)
Test Mode4:
Horizontal



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	7249.817	27.56	2.29	29.85	54.00	-24.15	Average
2	7249.817	39.56	2.29	41.85	74.00	-32.15	Peak
3	10687.370	38.65	7.61	46.26	74.00	-27.74	Average
4	10687.370	25.65	7.61	33.26	54.00	-20.74	Peak
5	10874.700	25.07	7.97	33.04	54.00	-20.96	Average
6	10874.700	38.07	7.97	46.04	74.00	-27.96	Peak
7	13789.740	34.72	12.70	47.42	74.00	-26.58	Average
8	13789.740	22.72	12.70	35.42	54.00	-18.58	Peak
9	14612.070	22.73	12.79	35.52	54.00	-18.48	Average
10	14612.070	34.73	12.79	47.52	74.00	-26.48	Peak
11	18000.000	21.03	16.41	37.44	54.00	-16.56	Average
12	18000.000	33.03	16.41	49.44	74.00	-24.56	Peak

Vertical



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1	7462.854	26.56	2.38	28.94	54.00	-25.06	Average
2	7462.854	39.56	2.38	41.94	74.00	-32.06	Peak
3	8982.627	25.65	5.49	31.14	54.00	-22.86	Average
4	8982.627	37.65	5.49	43.14	74.00	-30.86	Peak
5	11065.320	25.96	8.16	34.12	54.00	-19.88	Average
6	11065.320	37.96	8.16	46.12	74.00	-27.88	Peak
7	13473.910	22.36	12.63	34.99	54.00	-19.01	Average
8	13473.910	35.36	12.63	47.99	74.00	-26.01	Peak
9	16694.370	23.32	12.84	36.16	54.00	-17.84	Average
10	16694.370	36.32	12.84	49.16	74.00	-24.84	Peak
11	17896.040	21.09	15.99	37.08	54.00	-16.92	Average
12	17896.040	34.09	15.99	50.08	74.00	-23.92	Peak

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. The limit of ICES-003 in the 230MHz to 960MHz band is higher than that of FCC Part 15B, so the radiation emission test data conform to the limit of ICES-003.
5. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

6.2 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.107
ICES-003 Issue 7 Section 3.2.1

Test Method: ANSI C63.4-2014

Limits:

Limits for Class B devices

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.3.2 for details.

Test Procedures:

1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
3) For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

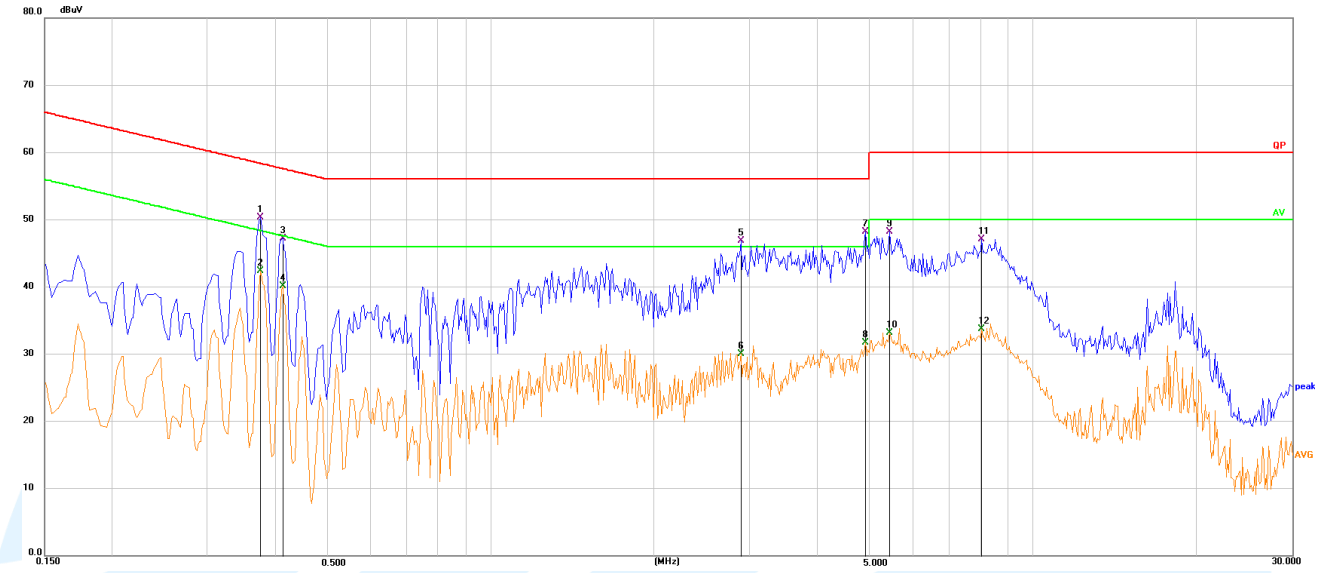
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

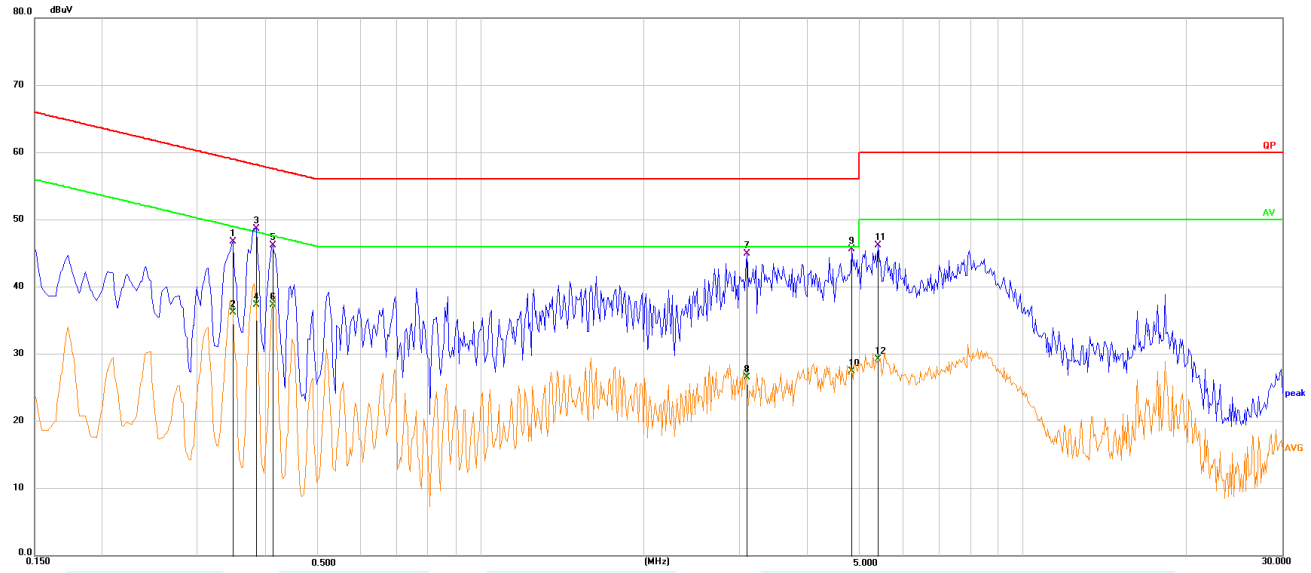
Quasi Peak and Average:
Test Mode1:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.3750	40.14	10.14	50.28	58.39	-8.11	QP
2	0.3750	32.23	10.14	42.37	48.39	-6.02	Average
3	0.4110	37.03	10.13	47.16	57.63	-10.47	QP
4	0.4110	29.94	10.13	40.07	47.63	-7.56	Average
5	2.8860	36.59	10.24	46.83	56.00	-9.17	QP
6	2.8860	19.83	10.24	30.07	46.00	-15.93	Average
7	4.9245	37.96	10.23	48.19	56.00	-7.81	QP
8	4.9245	21.50	10.23	31.73	46.00	-14.27	Average
9	5.4240	37.90	10.30	48.20	60.00	-11.80	QP
10	5.4240	22.89	10.30	33.19	50.00	-16.81	Average
11	8.0295	36.63	10.49	47.12	60.00	-12.88	QP
12	8.0295	23.19	10.49	33.68	50.00	-16.32	Average

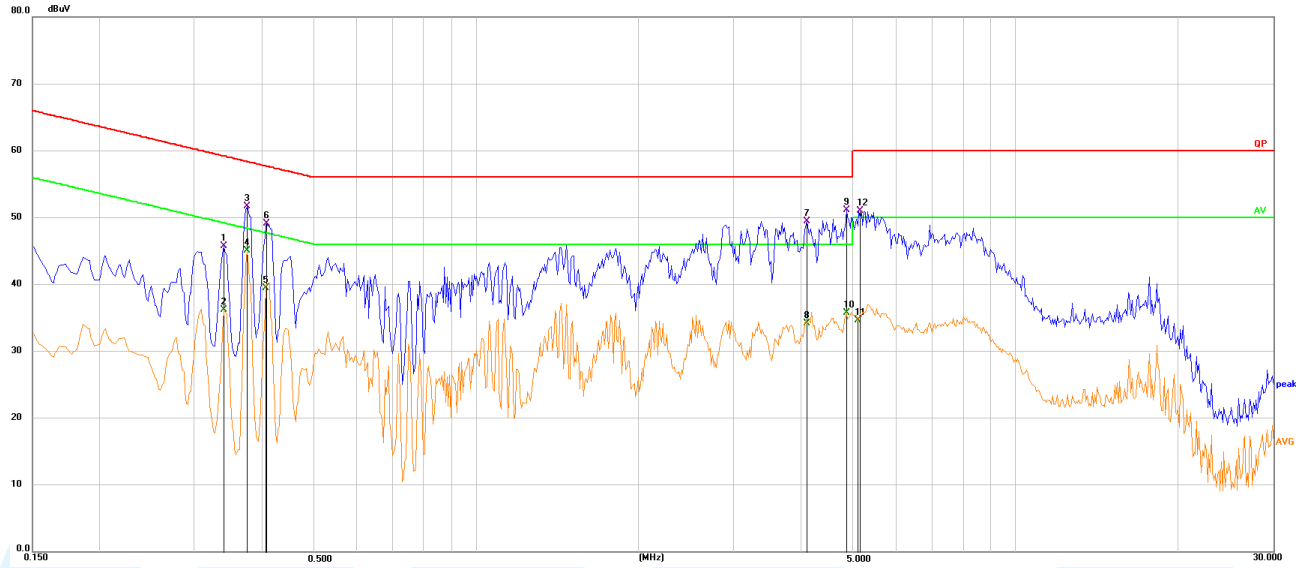
Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.3483	36.64	10.14	46.78	59.00	-12.22	QP
2	0.3483	26.10	10.14	36.24	49.00	-12.76	Average
3	0.3852	38.50	10.17	48.67	58.17	-9.50	QP
4	0.3852	27.19	10.17	37.36	48.17	-10.81	Average
5	0.4127	35.98	10.20	46.18	57.59	-11.41	QP
6	0.4127	27.16	10.20	37.36	47.59	-10.23	Average
7	3.0901	34.74	10.24	44.98	56.00	-11.02	QP
8	3.0901	16.32	10.24	26.56	46.00	-19.44	Average
9	4.8224	35.33	10.27	45.60	56.00	-10.40	QP
10	4.8224	17.12	10.27	27.39	46.00	-18.61	Average
11	5.3900	35.92	10.29	46.21	60.00	-13.79	QP
12	5.3900	18.97	10.29	29.26	50.00	-20.74	Average

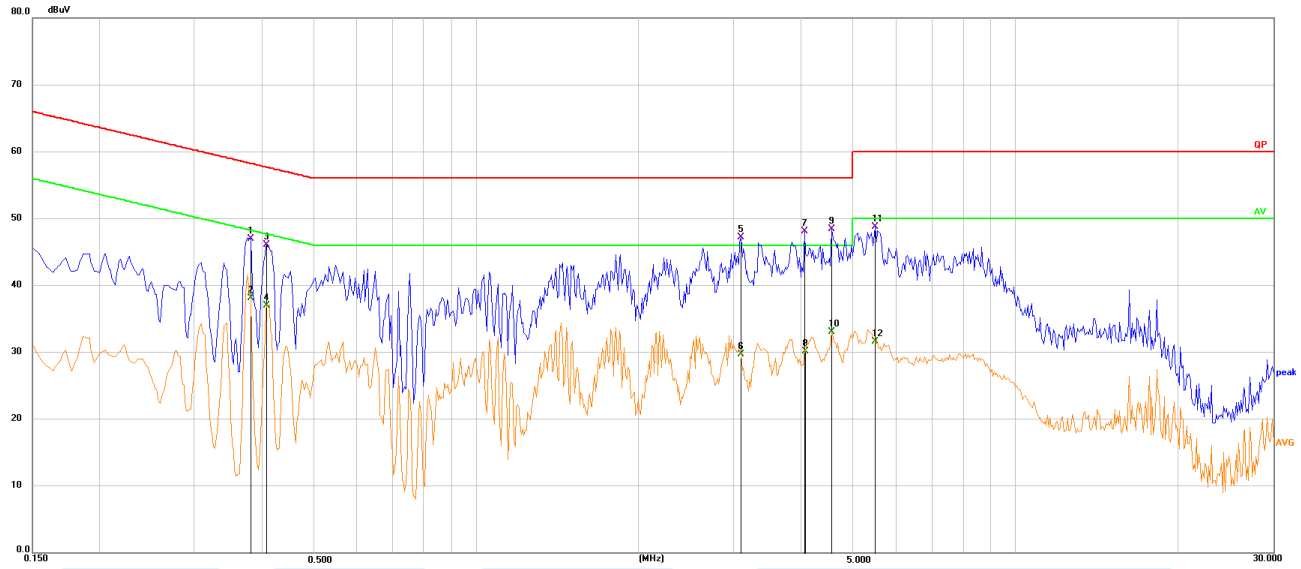
Quasi Peak and Average:
Test Mode2:

Live Line



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.3390	35.52	10.18	45.70	59.23	-13.53	QP
2	0.3390	26.00	10.18	36.18	49.23	-13.05	Average
3	0.3750	41.51	10.14	51.65	58.39	-6.74	QP
4	0.3750	34.96	10.14	45.10	48.39	-3.29	Average
5	0.4061	29.36	10.12	39.48	47.73	-8.25	Average
6	0.4065	38.95	10.12	49.07	57.72	-8.65	QP
7	4.1055	39.19	10.25	49.44	56.00	-6.56	QP
8	4.1055	23.96	10.25	34.21	46.00	-11.79	Average
9	4.8615	40.89	10.23	51.12	56.00	-4.88	QP
10	4.8615	25.46	10.23	35.69	46.00	-10.31	Average
11	5.1045	24.37	10.25	34.62	50.00	-15.38	Average
12	5.1359	40.70	10.25	50.95	60.00	-9.05	QP

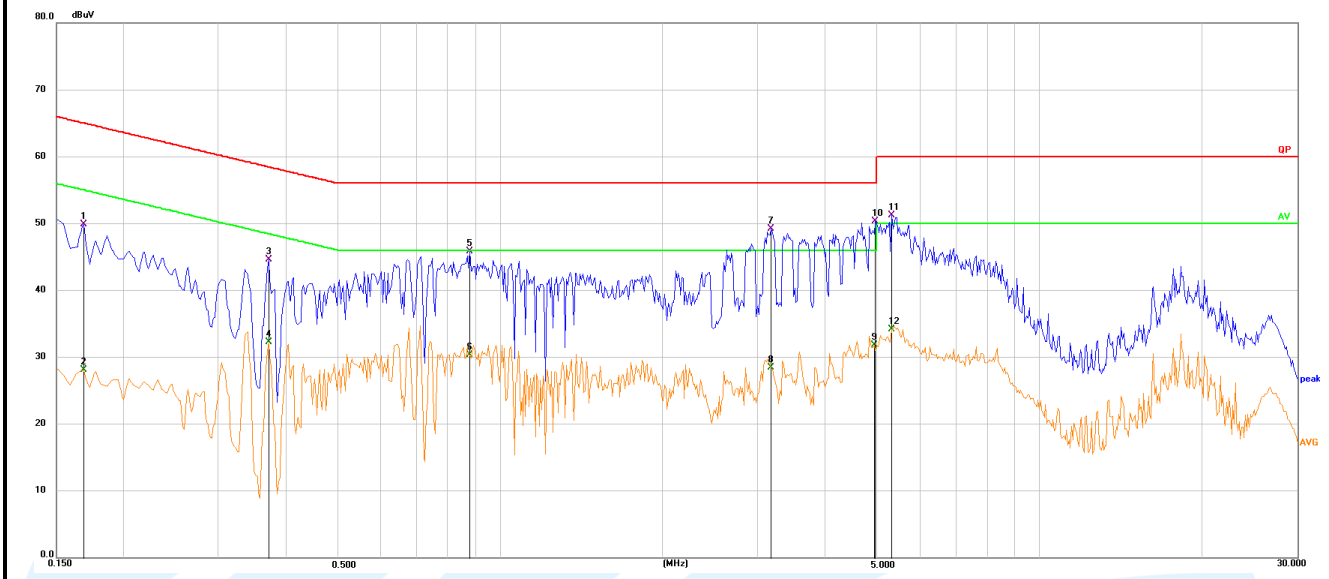
Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.3795	36.83	10.17	47.00	58.29	-11.29	QP
2	0.3795	27.94	10.17	38.11	48.29	-10.18	Average
3	0.4063	35.85	10.20	46.05	57.72	-11.67	QP
4	0.4063	26.79	10.20	36.99	47.72	-10.73	Average
5	3.0975	36.98	10.24	47.22	56.00	-8.78	QP
6	3.0975	19.42	10.24	29.66	46.00	-16.34	Average
7	4.0694	37.84	10.27	48.11	56.00	-7.89	QP
8	4.0875	19.81	10.27	30.08	46.00	-15.92	Average
9	4.5644	38.19	10.27	48.46	56.00	-7.54	QP
10	4.5644	22.78	10.27	33.05	46.00	-12.95	Average
11	5.4780	38.52	10.28	48.80	60.00	-11.20	QP
12	5.4780	21.26	10.28	31.54	50.00	-18.46	Average

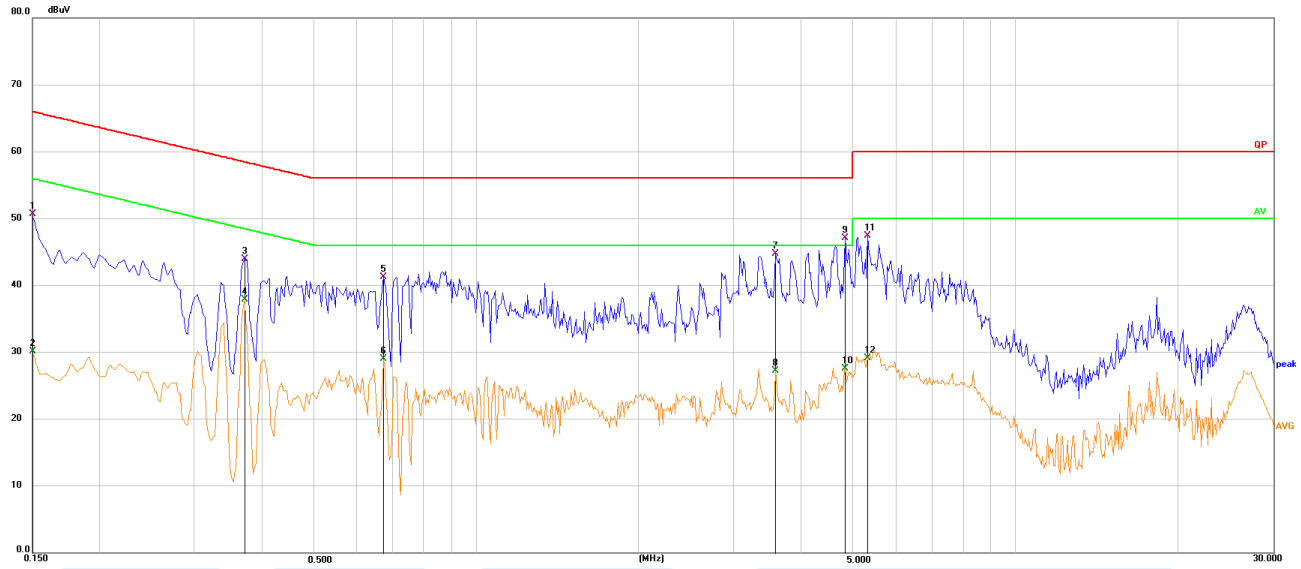
Quasi Peak and Average:
Test Mode3:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1680	39.71	10.19	49.90	65.06	-15.16	QP
2	0.1680	17.87	10.19	28.06	55.06	-27.00	Average
3	0.3704	34.41	10.14	44.55	58.49	-13.94	QP
4	0.3704	22.07	10.14	32.21	48.49	-16.28	Average
5	0.8790	35.60	10.29	45.89	56.00	-10.11	QP
6	0.8790	20.11	10.29	30.40	46.00	-15.60	Average
7	3.1875	38.92	10.24	49.16	56.00	-6.84	QP
8	3.1875	18.17	10.24	28.41	46.00	-17.59	Average
9	4.9380	21.55	10.23	31.78	46.00	-14.22	Average
10	4.9604	40.12	10.23	50.35	56.00	-5.65	QP
11	5.3205	40.91	10.28	51.19	60.00	-8.81	QP
12	5.3205	23.94	10.28	34.22	50.00	-15.78	Average

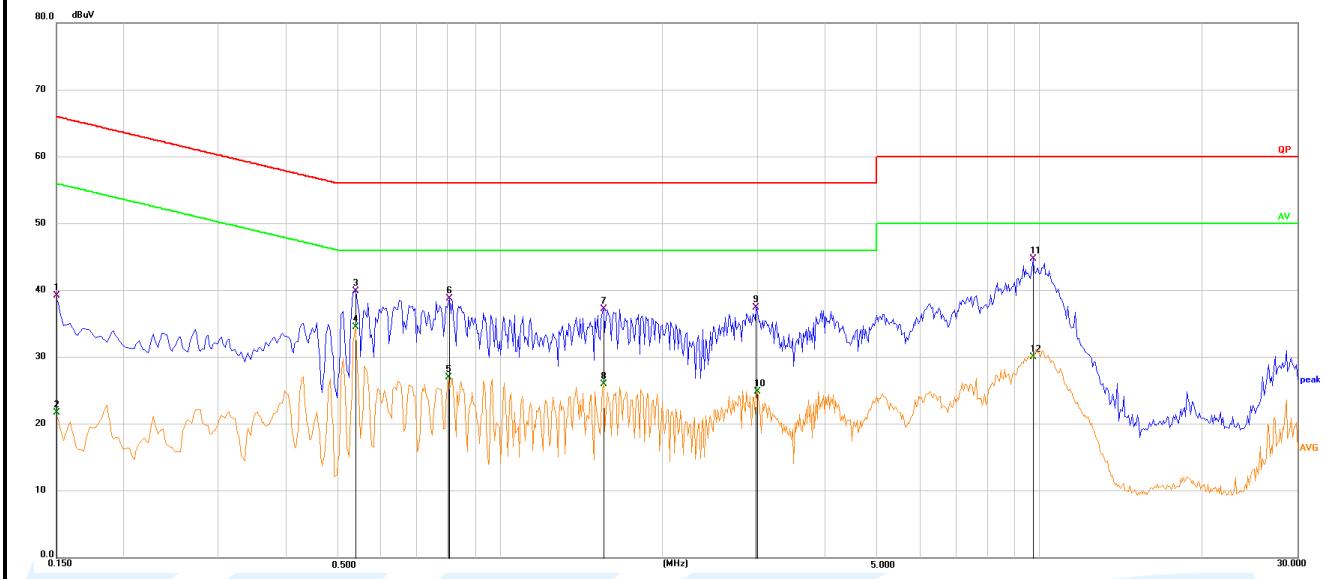
Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1500	40.46	10.19	50.65	66.00	-15.35	QP
2	0.1500	19.95	10.19	30.14	56.00	-25.86	Average
3	0.3704	33.76	10.16	43.92	58.49	-14.57	QP
4	0.3704	27.66	10.16	37.82	48.49	-10.67	Average
5	0.6720	31.01	10.25	41.26	56.00	-14.74	QP
6	0.6720	18.70	10.25	28.95	46.00	-17.05	Average
7	3.5880	34.50	10.25	44.75	56.00	-11.25	QP
8	3.5880	16.95	10.25	27.20	46.00	-18.80	Average
9	4.8255	36.77	10.27	47.04	56.00	-8.96	QP
10	4.8255	17.30	10.27	27.57	46.00	-18.43	Average
11	5.3250	37.07	10.29	47.36	60.00	-12.64	QP
12	5.3250	18.86	10.29	29.15	50.00	-20.85	Average

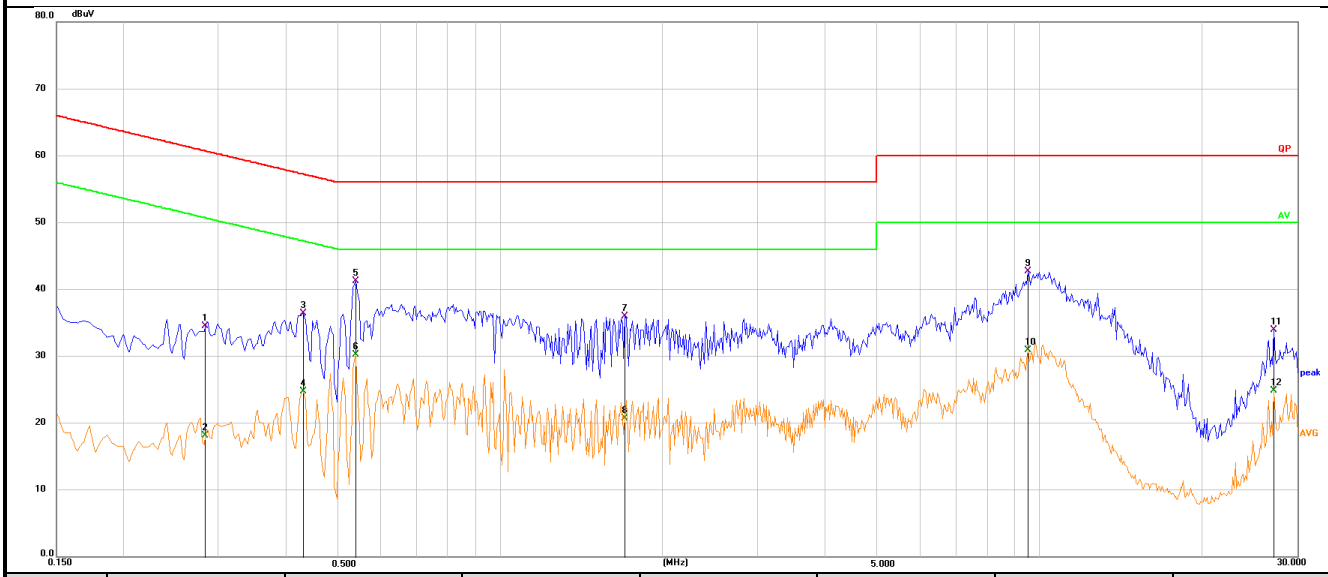
Quasi Peak and Average:
Test Mode4:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Detector
1	0.1500	28.97	10.20	39.17	66.00	-26.83	QP
2	0.1500	11.49	10.20	21.69	56.00	-34.31	Average
3	0.5370	29.74	10.19	39.93	56.00	-16.07	QP
4	0.5370	24.34	10.19	34.53	46.00	-11.47	Average
5	0.8025	16.78	10.25	27.03	46.00	-18.97	Average
6	0.8070	28.48	10.26	38.74	56.00	-17.26	QP
7	1.5540	26.97	10.28	37.25	56.00	-18.75	QP
8	1.5540	15.69	10.28	25.97	46.00	-20.03	Average
9	2.9805	27.20	10.25	37.45	56.00	-18.55	QP
10	2.9940	14.63	10.25	24.88	46.00	-21.12	Average
11	9.7170	34.21	10.48	44.69	60.00	-15.31	QP
12	9.7170	19.58	10.48	30.06	50.00	-19.94	Average

Neutral Line



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1	0.2832	24.45	10.09	34.54	60.72	-26.18	QP
2	0.2832	7.99	10.09	18.08	50.72	-32.64	Average
3	0.4290	26.17	10.21	36.38	57.27	-20.89	QP
4	0.4290	14.56	10.21	24.77	47.27	-22.50	Average
5	0.5370	30.95	10.27	41.22	56.00	-14.78	QP
6	0.5370	19.98	10.27	30.25	46.00	-15.75	Average
7	1.7024	25.64	10.28	35.92	56.00	-20.08	QP
8	1.7024	10.43	10.28	20.71	46.00	-25.29	Average
9	9.5504	32.27	10.37	42.64	60.00	-17.36	QP
10	9.5504	20.49	10.37	30.86	50.00	-19.14	Average
11	27.1590	23.09	10.84	33.93	60.00	-26.07	QP
12	27.1590	14.00	10.84	24.84	50.00	-25.16	Average

Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

********** End of Report **********